

EXHIBIT 2

microecologies® inc.*Certified Industrial Hygienists and Environmental Health Investigators***Date:** November 16, 2018**To:** Prof. Francis McGovern**Email:** mcgovern@law.duke.edu

Proposal for NYCHA Independent Mold Analyst/Expert**Background, Experience, and Qualifications**

The Industrial Hygiene staff at Microecologies has been investigating water damage and mold problems in NYCHA housing since 1997. We are the authors of the Asthma Intervention Methods (AIM) instructional program designed to identify and remediate asthma triggers, including water damage and mold, and this program has been implemented in collaboration with Little Sisters of the Assumption Family Health Services in low-income and NYCHA housing in East Harlem since 1999. Microecologies has conducted over 5,000 indoor environmental investigations over the past 25 years with over 4,000 of these investigations involving water damage and mold issues in residential housing. The staff that would be assigned to the NYCHA Independent Mold Analyst/Expert project if we were appointed are Bill Sothern and Chris Mikrut. Bill is the founder of Microecologies, is a Certified Industrial Hygienist, holds a MS degree from Hunter College in Environmental and Occupational Health Sciences (EOHS), and will receive his Doctor of Public Health Degree from the CUNY School of Public Health in December 2018. He is a recognized contributor to the NYC-DOHMH *Guidelines on Assessment and Remediation of Fungi in Indoor Environments* and to the NIEHS *Disaster Recovery – Mold Remediation Guidance* booklet. Chris also holds a MS degree from Hunter College in EOHS and has served as Senior Investigator at Microecologies since 2012. In July 2016, Microecologies was engaged as mold expert to the Special Master in the Baez et al. vs. NYCHA case. In that capacity, Bill and Chris have worked side-by-side with NYCHA management, Plaintiffs, and the Special Master to use our knowledge and experience to assist in the development of procedures and protocols that enable NYCHA development maintenance and Skilled-Trade staff to effectively address the excessive moisture and mold problems that are significant contributors to the excess asthma prevalence in NYCHA housing. This work has included identifying the primary root-causes of the excessive moisture conditions that have contributed to the high levels of mold recurrence in NYCHA housing and the development of remediation strategies to address these underlying root-causes, including the exhaust ventilation deficiencies and insulation deficiencies that are primary contributors to the pervasive condensation-related excessive moisture problems. We also developed and conducted the initial training programs for the training of the development maintenance management staffs in the 10 intervention developments selected for the intervention/non-intervention Pilot Study program. This training program was developed based on our previous experience in NYCHA housing and having conducted over 50 inspections of mold and root-cause conditions during the first five months of our engagement.

Scope of Services

Based on the foregoing and the requirements set forth in the April 6, 2018 Amended Stipulation and Order of Settlement, following is the scope of work that we recommend for the Independent Mold Analyst/Expert:

- Assist Environmental Education Associates (EEA) in the development of the NYCHA-wide training program scheduled to be conducted in 2019 to help ensure that the that the training program provides the requisite knowledge of the mold and excessive moisture issues, underlying root-cause issues, and procedures/protocols that have been developed to address these issues.

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- Conduct a sufficient number of field inspections shortly after each stage of the training program to assure that the development maintenance supervisors have gained the necessary knowledge to enable them to conduct a valid mold and root-cause assessment in response to a parent mold work order. A valid assessment is the essential first step that has been designed to automatically generate the necessary mold remediation and root-cause repair child work orders.
- Conduct a sufficient number of comprehensive inspections in response to recurrent (same apartment, same room) mold work orders, including site visits to observe the performance of the mold remediation and root-cause repair work mandated by the auto-generated child work orders associated with the parent recurrent mold work order. This is a form of root-cause failure analysis (RCFA) that will help to identify whether these recurrences are related to procedural problems, personnel problems, “intractable” problems, or problems that may require capital repair.
- Based on the inspections described in the two preceding points, collaborate with NYCHA management to review our findings and make recommendations for follow-up training, improved compliance with current standard protocols/procedures, or changes/improvements in current standard protocols/procedures.
- We recognize that inadequate exhaust ventilation is a major driver of the pervasive and recurrent condensation problems that are the single largest contributor to the mold problems in NYCHA housing. We also recognize that NYCHA management has committed to inspecting and correcting rooftop exhaust fan problems, including the operation of these fans 24/7. However, if in our RCFA inspections it is found that inadequate exhaust ventilation continues to be a major driver of the excessive moisture and mold problems, then we will request authorization to conduct a more comprehensive evaluation and propose effective and affordable solution options.
- Similar to the above, we recognize that missing and damaged pipe-wrap insulation on cold water pipes in wall cavities is a significant contributor to condensation-related recurrent excessive moisture and mold problems, especially in the summertime when these types of problems manifest as a result of high outdoor temperatures and ambient humidity. This is a legacy issue as a result of a long history of plumbing repairs that were made without properly re-insulating cold water risers and pipes. As part of our RCFA inspections, we will conduct inspections during the performance of work orders that provide for wall-breaks and insulation repairs to assure that the re-insulation work is conducted thoroughly and effectively, such that it will not need to be revisited.
- Upon requests from Ombudsperson, conduct mold and root-cause inspections of apartments and prepare site-specific remediation plans and root-cause repair plans based on such inspections.
- Collaborate as may be requested with the Independent Data Analyst and NYCHA to establish a system for identifying and providing metrics on the causes of recurrent work orders such that efforts and resources can be targeted to reduce recurrences.

Price (as a courtesy, as shown below a 50% discount has been applied to Microecologies' normal rates)

	<u>Normal Rate</u>	<u>Discounted Rate</u>
Certified Industrial Hygienist (CIH)	\$375/hr	\$187.50/hr
Senior Investigator	\$275/hr	\$137.50/hr

Estimated cost per month:

\$10,000 - 15,000*

*This is an estimated average cost only and actual billing will be based on actual hours logged and may vary from month to month.

Payment terms

First month to be paid prior to the start of project. For following months costs for project to be invoiced monthly. Payment of invoices due within 30 days from submission of invoice.

Submitted by

Accepted by

Microecologies[®] Inc.
William Sothern, MS, CIH
Certified Industrial Hygienist
and Chief Operating Officer

Date _____

microecologies® inc.*Certified Industrial Hygienists and Environmental Health Investigators*

Date: February 4, 2019
To: Prof. Francis McGovern

Email: mcgovern@law.duke.edu

**Proposal for Independent Mold Analyst/Expert -
Baez v. NYCHA Quality Assurance Inspections**

Background, Experience, and Qualifications

The Industrial Hygiene staff at Microecologies has been investigating water damage and mold problems in NYCHA housing since 1997. We are the authors of the Asthma Intervention Methods (AIM) instructional program designed to identify and remediate asthma triggers, including water damage and mold, and this program has been implemented in collaboration with Little Sisters of the Assumption Family Health Services in low-income and NYCHA housing in East Harlem since 1999. In July 2016, Microecologies was engaged as mold expert to the Special Master in the Baez et al. vs. NYCHA case. In that capacity, Bill and Chris have worked side-by-side with NYCHA management, Plaintiffs, and the Special Master to use our knowledge and experience to assist in the development of procedures and protocols that enable NYCHA development maintenance and Skilled-Trade staff to effectively address the excessive moisture and mold problems that are significant contributors to the excess asthma prevalence in NYCHA housing.

For 25 years, Microecologies has taken shared responsibility for finding and correcting root-cause problems on thousands of mold inspections, and Microecologies has conducted over 150 inspections in NYCHA housing in response to mold complaints where we have gained an in depth understanding of the types, prevalence, and nuances of the root-causes of the excessive moisture conditions that have contributed to the high levels of mold recurrence in NYCHA housing and have helped NYCHA to develop remediation strategies to address these underlying root-causes, including the exhaust ventilation deficiencies and insulation deficiencies that are primary contributors to the pervasive condensation-related excessive moisture problems.

Based on our experience in identifying mold and root-cause problems, our knowledge of the mold and root-cause problems specific to NYCHA, and our expertise as Certified Industrial Hygienists in understanding ventilation and other building systems, we also developed and conducted the initial training programs for the training of the development maintenance management staffs in the 10 intervention developments selected for the intervention/non-intervention Pilot Study program and worked with NYCHA management in the development of the *Interim Guidance on Roof Fan Operation and Inspection*, *Interim Guidance on Wall Breaks*, *Interim Guidance on Pipe Insulation*, and *NYCHA Standard Procedure Manual - Mold/Mildew Control In NYCHA Residential Buildings*.

The foregoing is important to consider because it should be recognized that the person conducting the QA inspections must be accepted by the PMS' and APMS' as an authority whose knowledge exceeds theirs and is qualified both to critique their work and to help them understand how to improve their inspection work product such that the potential for re-occurrences is eliminated or minimized.

Scope of Services

Based on the requirements set forth in the January 29, 2019 RFP, following are the scopes of work that we recommend for the three types of QA Inspections:

Initial QA Inspections

- Each Initial QA Inspection should be conducted in a different development. Prior to conducting the inspection, we need to be provided with the recently completed initial PMS/APMS mold inspection work order and the child work orders that were created therefrom. In addition, we need to be provided with any other mold work orders created for the same apartment same room during the preceding 12 months. Where there is a history of previous work orders within the past 12 months, the QA inspector should carefully review this history, as the PMS/APMS would be expected to have done prior to his/her initial inspection.
- Between 7-10 days from completion of the initial PMS/APMS mold inspection, we will conduct an independent initial QA inspection to determine the validity of PMS/APMS inspection findings with respect to the following seven major categories: 1) visible mold; 2) visible water damage; 3) wet readings; 4) exhaust ventilation; 5) general conditions including substrate identification; 6) root-cause and problem selection; and, 7) remediation tasks. During the inspection, differences between the PMS/APMS inputs on the completed initial mold work order and the findings of the initial QA inspection will be discussed and reconciled with the PMS/APMS and the designated NYCHA representative. Differences that are visible will be photo-documented. When possible the initial QA inspection will be conducted alongside both the PMS and APMS such that each individual that is responsible for conducting mold inspections in that development gets the benefit of the Mold Analyst/Expert's knowledge. Depending on the extent of the differences, the QA inspector and the NYCHA representative should discuss the need for re-training of the PMS/APMS.
- A reporting format will be developed to present the findings of our initial QA inspection, which will include a section indicating our agreement or disagreement with the initial PMS/APMS mold inspection (seven major categories as indicated above). Where significant disagreements are found such that the child work orders created off of the initial inspection are not correct, our initial QA inspection will be considered a failure and the development should be flagged for a second initial QA inspection (in a different randomly selected apartment) to be conducted by the NYCHA Mold Unit within 90 days. For failed initial QA inspections, the original parent mold work order and associated child work orders related to the initial inspection should be cancelled in Maximo a new parent mold work order should be created. The initial QA inspection report will indicate the appropriate inputs to be entered into the new parent work order. If the second initial QA inspection (in a different randomly selected apartment) conducted by the NYCHA Mold Unit is also failed, then some appropriate corrective action or penalty should be considered by NYCHA.

Midstream QA Inspections

- The Independent Data Analyst will select the randomized initial PMS/APMS mold inspection work orders that indicate a wall-break was necessary and that the probable root-cause was found to be insulation problems on plumbing pipes within the wall cavity leaks from plumbing pipes within the wall cavity. Prior to conducting our inspection, we will need to be provided with the initial PMS/APMS mold inspection work order and the child work orders related to the necessary root-cause repair work.
- Following completion of the necessary root-cause repair work (insulation/re-insulation or repair of plumbing pipes in the wall cavity), but before the wall has been closed, we will conduct a midstream QA inspection to verify the completion of the necessary work and to evaluate the quality of insulation/re-insulation work that has been completed. Based on the findings of the inspections that we have conducted to date, it is evident that cold water pipes in wall cavities that have been repaired over past decades have not been re-insulated,

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and it is also evident that in many cases the original insulation on cold water risers and pipes has lost integrity over these decades. These are major contributing root-cause factors to the recurrence of excessive condensation-related moisture and consequential recurrent mold growth problems in NYCHA.

- The primary purpose of these midstream QA inspections is to assure that insulation deficiencies on the cold water pipes/fittings and risers within the wall cavities have been properly identified and properly re-insulated. To accomplish this, it is necessary to have full visual access to the cold water pipes/fittings and risers (with the assistance of the standard Rigid boroscopes), and it is reasonable to expect that during the course of these midstream QA inspections, the size of the wall-break may need to be increased to make such an assessment. It should also be recognized that ongoing moisture problems in wall cavities may be the results of excessive moisture problems in apartments directly above and may require further evaluation either as a part of the scheduled midstream QA inspection or as a separate inspection for which a child work would need to be created and closed before the parent mold work order could be closed.

Post-Completion QA Inspections

- Each Post-Completion QA Inspections should be conducted in a different development and should be selected from the pool of developments in which Initial QA Inspections were not conducted. Prior to conducting the inspection, we need to be provided with the recently completed PMS/APMS post-completion QA inspection work order, the initial PMS/APMS mold inspection work order, and the child work orders that were completed (including photo documentation). The QA inspector should carefully review this history, as the PMS/APMS would be expected to have done prior to his/her post-completion QA inspection.
- Between 7-15 days from completion of the PMS/APMS post-completion QA inspection, we will conduct an independent post-completion QA inspection to verify the absence of visible mold, water damage, and wet readings, verify that the children work orders have been successfully completed (based on conditions that are readily visible and child work order review), evaluate the current function of exhaust ventilation in bathrooms/kitchens as appropriate, and identify other deficiencies in the initial PMS/APMS mold inspection work order where conditions were not corrected due to their not having been properly identified. During the inspection, differences between the PMS/APMS inputs on their completed post-completion QA mold work order and the findings of our post-completion QA inspection will be discussed and reconciled with the PMS/APMS and the NYCHA representative. Differences that are visible will be photo-documented. When possible the post-completion QA inspection will be conducted alongside both the PMS and APMS such that each individual that is responsible for conducting post-completion QA inspections and sign-offs in that development gets the benefit of the Mold Analyst/Expert's knowledge. Depending on the extent of the differences, the QA inspector and the NYCHA representative should discuss the need for re-training of the PMS/APMS.
- A reporting format will be developed to present the findings of our post-completion QA inspection, which will include a section indicating our agreement or disagreement with the PMS/APMS post-completion QA inspection components. Where significant disagreements are found, our post-completion QA inspection will be considered a failure and the development should be flagged for a second post-completion QA inspection (in a different randomly selected apartment) to be conducted by the NYCHA Mold Unit within 90 days. For failed post-completion QA inspections, a new parent mold work order should be created. Our post-completion QA inspection report will indicate the appropriate inputs to be entered into the new parent work order. If our second post-completion QA inspection (in a different randomly selected apartment) conducted by the NYCHA Mold Unit is also failed, then some appropriate corrective action or penalty should be considered by NYCHA.

Cost Estimates (as a courtesy, as shown below a 50% discount has been applied to Microecologies' normal rates)

	<i>Normal Rate</i>	<i>Discounted Rate</i>
Certified Industrial Hygienist (CIH)	\$375/hr	\$187.50/hr
Senior Investigator	\$275/hr	\$137.50/hr

Initial QA Inspections

Field Component

150 inspections ÷ 3 inspections per day = 50 days
 \$137.50 per hr x 9 hrs per day = \$1,237.50 per day
 50 days x \$1,237.50 per day =\$61,875 per year

Report Preparation (Includes review with CIH)

150 inspections ÷ 6 inspections per day = 25 days
 \$137.50 per hr x 9 hrs per day = \$1,237.50 per day
 25 days x \$1,237.50 per day = \$30,937.50 per year

CIH Review Time

150 inspections x 0.5 hrs per inspection = 75 hours
 75 hrs per year x \$187.50 per hr\$14,062.50 per year

Total estimated Initial QA Inspection costs..... \$106,875 per year*

Midstream QA Inspections

Field Component

50 inspections ÷ 3 inspections per day = 16.67 days
 \$137.50 per hr x 9 hrs per day = \$1,237.50 per day
 16.67 days x \$1,237.50 per day = \$20,625 per year

Report Preparation (Includes review with CIH)

50 inspections ÷ 6 inspections per day = 8.33 days
 \$137.50 per hr x 9 hrs per day = \$1,237.50 per day
 8.33 days x \$1,237.50 per day =\$10,312.50 per year

CIH Review Time

50 inspections x 0.5 hrs per inspection = 25 hrs
 25 hrs per year x \$187.50 per hr\$4,687.50 per year

Total estimated Midstream QA Inspection costs..... \$35,625 per year*

Post-Completion QA Inspections*Field Component*

50 inspections ÷ 3 inspections per day = 16.67 days

\$137.50 per hr x 9 hrs per day = \$1,237.50 per day

16.67 days x \$1,237.50 per day = \$20,625 per year

Report Preparation (Includes review with CIH)

50 inspections ÷ 6 inspections per day = 8.33 days

\$137.50 per hr x 9 hrs per day = \$1,237.50 per day

8.33 days x \$1,237.50 per day =\$10,312.50 per year

CIH Review Time

50 inspections x 0.5 hrs per inspection = 25 hrs

25 hrs per year x \$187.50 per hr\$4,687.50 per year

Total estimated Post-Completion QA Inspection costs..... \$35,625 per year*Supervised QA Initial, Midstream, and Post-Completion Inspections

As provided for in the RFP, the above estimated costs provide for field inspections to be conducted by one highly qualified and thoroughly trained inspector. Our experience indicates that some of these more complex QA inspections would benefit from the presence of a second/supervisory inspector (Bill Sothern, CIH or Chris Mikrut, Team Leader), and that Bill's and Chris' presence (which can be scheduled or on demand) will continue to benefit the ongoing QA inspections.

Chris Mikrut, Team Leader

\$137.50 per hr x 9 hrs per day = \$1,237.50 per day

20.83 days x \$1,237.50 per day = \$25,781.25 per year

Bill Sothern, CIH

\$187.50 per hr x 9 hrs per day = \$1,687.50 per day

12.5 days x \$1,687.50 per day = \$21,093.75 per year

Total estimated Supervised QA Inspection costs..... \$46,875 per year***Total estimated Costs\$225,000 per year***

- * These cost estimates are based on our ability to conduct three inspections per day (8 AM - 6 PM), including a review of prior work orders and discussion/reconciliation of findings with PMS/APMS and NYCHA representative. Actual number of days required to achieve 150 Initial, 50 Midstream, and 50 Post-Completion Inspections may be higher and billing will be based on actual days of field work.

Payment terms

Estimated first month cost to be paid at the start of project. Following month costs to be invoiced monthly based on actual days and hours. Payment of invoices due within 30 days from submission of invoice.

Submitted by

Accepted by

Microecologies, Inc.
William Sothern, DrPH, MS, CIH
Certified Industrial Hygienist
and Chief Operating Officer

Date _____